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EXAMINER	
DOLAN, JENNIFER M	
ART UNIT	**PAPER NUMBER**
2813	

DATE MAILED: 10/31/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/824,006	CHANG ET AL.	
	Examiner	Art Unit	
	Jennifer M. Dolan	2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 July 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *17-29* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *17-29* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 17-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,549,716 to Takahashi et al. in view of Japanese Patent Publication JP 57-167657 to Hokozaki et al.

Regarding claim 17, Takahashi discloses a universal packaging system (figure 1) for back-end manufacturing of ICs (see column 3, lines 20-55) comprising: a front-of-line portion for receiving (1) a die strip (2) and for processing the die-strip using a first plurality of processes (3-10) that function independently of the die size of the strip (see column 1, lines 53-60; column 2, lines 5-10, 50-57; column 4, line 65 – column 5, line 55; "diversified" production, the use of a "through-line" or "conveyor", and the use of cameras rather than mechanical means for die-strip alignment indicate that the process is compatible with different-sized dice); a first part of an end-of-line portion for receiving the die-strip and processing through a second plurality of processes that function independently of the die size (figure 2; column 3, line 55 – column 4, line 8; independence of die size is based on same reasons listed supra for the front-of-line portion); and a sawing process for receiving the die-strip from the first part and for sawing the die strip into individual devices (column 5, lines 60 – 67).

Although it is apparent that the sawing apparatus is receiving some sort of control signal to determine where the saw lines are to be placed, Takahashi fails to teach the means by which this is accomplished.

Hokozaki teaches the usage of a computer database and computer control for providing the size of the die to be scribed, and using the die size information to scribe the devices (see 'Constitution'; alternately, see page 3 of the translation).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to specify in the system of Takahashi that the sawing process is controlled by a computer having a memory database for storing die size, as suggested by Hokozaki. The rationale is as follows: A person having ordinary skill in the art would have been motivated to use a computer controller and database for die size, because in order to accommodate diverse chips, as suggested by Takahashi, the sawing apparatus would either need to have cutting line positions supplied by the controller (as in Hokozaki), or to determine the position of the cutting lines through a measuring or detection process. Since Takahashi does not disclose the nature of the sawing control system, a person having ordinary skill in the art would have been motivated to look to the prior art for any efficient and effective alternate methods for cleaving a die of any size, such as the method taught by Hokozaki (also see 'Purpose' section of Hokozaki). Furthermore, a person skilled in the art would prefer a system using a database for die size values rather than a system using an active measurement, because a measurement-type system would require additional cameras or measuring apparatuses, as well as additional fabrication complexity.

Regarding claim 18, Takahashi discloses a sorting process (column 6, lines 1-14) for receiving the devices from the sawing process and for sorting the individual devices (figure 2, column 6, lines 1-14), the sawing and sorting process being a second part of the end-of-line portion (figure 2).

Regarding claim 19, it is implicit that a computer control system is controlling the front-of-line portion, the end-of-line portion, and the sorting process, because Takahashi teaches that the processes is 'unmanned' (column 2, lines 50-55) and that device transfer, alignment, and sorting occurs through binary image processing from the cameras (column 4, lines 20-55), which would require a computer to process the image and decide how to align the chip or whether to dispose of the chip.

Regarding claim 20, Takahashi discloses an automated in-line cure process (12).

3. Claims 17, 20-23, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,465,743 to Owens in view of Hokozaki et al. and U.S. Patent No. 4,674,670 to Watanabe et al.

Regarding claims 17, 20-23 and 26, Owens discloses a packaging system comprising: a front-of line portion (column 3, line 65 – column 4, line 17) for receiving and processing the die strip using a plurality of automated, in-line processes (column 3, line 65 – column 4, line 17; die-attach, cleaning, and wire-bonding processes); an in-line mold process, cure process, and an in-line solder ball attach process, the solder ball process utilized on copper (38) and plastic (12) for processing the die-strip after the front-of-line process (column 4, lines 17-45); and an end-of-line

sawing process for sawing the die-strip into individual devices (column 4, lines 53-56; the term 'dicing' indicates sawing).

Owens fails to disclose that the front-of-line and back-end processes are independent of the die size. Owens further fails to disclose that the die size is obtained using a computer database.

Hokozaki teaches the usage of a computer database and computer control for providing the size of the die to be scribed, and using the die size information to scribe the devices (see 'Constitution'; alternately, see page 3 of the translation).

Watanabe discloses general-purpose automated die assembly equipment, wherein the conveyance means has an adjustable width to hold any die size (column 5, lines 1-5) and where camera and computer controls are used to properly align any size die in the apparatus (column 2, lines 10-20, column 3, lines 1-15; column 5, lines 1-30).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system of Owens, such that any size die is accommodated, as suggested by Watanabe, and such that die size is supplied by a computer database, as suggested by Hokozaki. The rationale is as follows: A person having ordinary skill in the art would have been motivated to modify the system of Owens, such that any size die is accommodated in the in-line assembly apparatuses, because using generalized equipment with conveyance and alignment means independent of die size allows the die assembly system to be used with any device, rather than requiring the system to be dedicated to a single device type, which increases the flexibility, cycle speed, and degree of automation of the system (see Watanabe, column 1, lines 5-20, 50-60; column 2, lines 22-30). A person having ordinary skill in the art would further

have been motivated to use a computer controller and database for die size, because in order to accommodate diverse chips, the sawing apparatus would either need to have cutting line positions supplied by the controller (as in Hokozaki), or to determine the position of the cutting lines through a measuring or detection process. Since Owens does not disclose the nature of the sawing control system, a person having ordinary skill in the art would have been motivated to look to the prior art for any effective and efficient methods for cleaving a die of any size, such as the method taught by Hokozaki (also see 'Purpose' section of Hokozaki). Furthermore, a person skilled in the art would prefer a system using a database for die size values rather than a system using an active measurement, because a measurement-type system would require additional cameras or measuring apparatuses, as well as additional fabrication complexity.

4. Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi in view of Hokozaki, as applied to claim 17 above, and further in view of U.S. Patent No. 5,336,931 to Juskey et al.

Takahashi discloses that the front-of-line portion comprises: an in-line die attachment process (4), an in-line cure process (6) coupled to the die-attachment process, and an in-line bond process (7) coupled to the cure process, all functioning independently of die size

Takahashi fails to teach a plasma cleaning process immediately before and a second plasma clean after the wirebonding.

Juskey teaches that in conventional die assembly, a plasma clean process occurs immediately before and after the wirebonding (figure 3; column 5, lines 5-15).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system of Takahashi in view of Hokozaki, such that plasma clean steps are added immediately before and after the wirebonding, as suggested by Juskey. The rationale is as follows: A person having ordinary skill in the art would have been motivated to add plasma cleaning steps, because plasma cleaning is conventional before wirebonding in order to ensure that the wirebonding pads on the device are sufficiently clean of debris or residual adhesive for a high-integrity wirebond, and after wirebonding, to remove residues from wirebonding and ensure that the encapsulant disposed on the surface in the subsequent step will adhere to the surface, as is notoriously old, conventional, and well known in the art.

5. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi in view of Hokozaki, as applied to claim 17 above, and further in view of U.S. Patent No. 5,499,717 to Hayashi.

Takahashi discloses testing, sorting, and tray storage processes coupled to the end-of-line portion (column 6, lines 1-15).

Takahashi fails to teach storing the devices on a reeled tape.

Hayashi teaches storage of finished chips on a reeled tape (column 1, lines 10-25).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system of Takahashi in view of Hokozaki, such that the finished chips are stored in a reeled tape, as suggested by Hayashi. The rationale is as follows: A person having ordinary skill in the art would have been motivated to store the chips in a reeled tape, because reeled tape temporary carriers are old and well known in the art of electronic assemblies,

and provide the additional advantages of compact storage, protection of the devices, and compatibility with apparatuses for automated mounting of the parts (also see Hayashi, column 1, lines 10-25).

6. Claims 18 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Owens in view of Hokozaki et al. and Watanabe et al. as applied to claims 17 and 26 above, and further in view Takahashi et al.

Owens fails to disclose a system of testing and sorting the devices.

Takahashi discloses an end-of-line portion including a testing and sorting process (column 6, lines 1-15).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add the testing and sorting process suggested by Takahashi to the packaging system of Owens as modified by Hokozaki and Watanabe. The rationale is as follows: A person having ordinary skill in the art would have been motivated to add a testing and sorting process, in order to find and eliminate defective integrated circuits, such that they are not further processed or installed on a circuit board (see Takahashi, column 6, lines 1-15).

7. Claims 24 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Owens in view of Hokozaki et al. and Watanabe et al., as applied to claims 17 and 26 above, and further in view of Juskey et al.

Owens discloses in-line die-attach/cure processes (in die-attach machine; see column 3, line 60 – column 4, line 9), a cleaning process (column 4, lines 9-12), and a wirebonding process (column 4, lines 12 – 18).

Owens fails to teach plasma clean processes before and after the wirebonding process.

Juskey teaches that in conventional die assembly, a plasma clean process occurs immediately before and after the wirebonding (figure 3; column 5, lines 5-15).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system of Owens in view of Hokozaki and Watanabe, such that plasma clean steps are added immediately before and after the wirebonding, as suggested by Juskey. The rationale is as follows: A person having ordinary skill in the art would have been motivated to add plasma cleaning steps, because plasma cleaning is conventional before wirebonding in order to ensure that the wirebonding pads on the device are sufficiently clean of debris or residual adhesive for a high-integrity wirebond and after wirebonding, to remove residues from wirebonding and ensure that the encapsulant disposed on the surface in the subsequent step will adhere to the surface, as is notoriously old, conventional, and well known in the art.

8. Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Owens in view of Hokozaki et al. and Watanabe et al. and further in view Takahashi et al. as applied to claim 27 above, and further in view of Hayashi.

The combination of Owens in view of Hokozaki, Watanabe, and Takahashi, as applied to claim 27, supra, discloses the assembly process comprising a test process.

Owens fails to disclose storage of devices in a reeled tape.

Hayashi teaches storage of finished chips on a reeled tape (column 1, lines 10-25).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system of Owens as modified by Hokozaki, Watanabe, and Takahashi, such that the finished chips are stored in a reeled tape, as suggested by Hayashi. The rationale is as follows: A person having ordinary skill in the art would have been motivated to store the chips in a reeled tape, because reeled tape temporary carriers are old and well known in the art of electronic assemblies, and provide the additional advantages of compact storage, protection of the devices, and compatibility with apparatuses for automated mounting of the parts (also see Hayashi, column 1, lines 10-25).

Response to Arguments

9. Applicant's arguments filed 7/21/05 have been fully considered but they are not persuasive.

Regarding the rejection based on Takahashi and Hokozaki, the Applicant argues that the Takahashi reference is silent and gives no indication that any part of the manufacturing process is capable of functioning independently of the size of the die strip. The Applicant further argues that there is no motivation explicitly provided in the Hokozaki reference for making the combination cited in the rejection. The Applicant further requests a full translation of the Hokozaki reference.

The Examiner notes that a full translation of the Hokozaki reference has been provided herewith. The Examiner respectfully disagrees with the Applicant's assertions that Takahashi does not suggest size insensitivity. Takahashi teaches the use of conveyor elements, which are

clearly inherently capable of transferring articles of varying sizes, to transfer the die strips between individual back-end apparatuses (see column 2, lines 1-3). Takahashi further teaches the usage of a camera system for conducting die bonding, wire bonding, or any of the back-end processes that may be size dependent. Since a camera system for locating specific features and conducting the back-end processes relative to those specific features is also inherently capable of usage with a plurality of die sizes, it is respectfully submitted that Takahashi does teach a system that 'functions independently of the die size" as claimed. Please note that the specific claim language only requires that the system can function independently of the die size (i.e., the specific elements of the system are capable of functioning with varying die sizes), and hence, it is not necessary for the Takahashi reference to specifically state that the system uses a plurality of die sizes in order to anticipate the claims. Also, note that the specification of the present application suggests that a system functions independently of die size by using conveyor belts (see page 29, lines 5-9) and camera recognition (see page 38). Hence, it is unclear how the system disclosed by the Applicant differs in any way from that taught by Takahashi with respect to 'size insensitivity'. The Examiner finally notes that while the stated "diversified small quantity production" does not explicitly guarantee usage of different sizes, the term is highly suggestive of varying sizes, and a person skilled in the art would more reasonably assume that "diversified small quantity production" in a system using generally size compatible conveyance and substations would include varying die sizes, rather than the diversified dice coincidentally having an identical size suggested by the Applicant.

Hokozaki is merely combined with the Takahashi reference to show that die scribing systems in which any die size can be scribed from a substrate or carrier based on information

conveyed from a database is known in the art (see, in particular, page 3 of the translation). The Applicant is respectfully reminded that Hokozaki need not explicitly state motivations for combining such a feature with the invention of Takahashi, but rather, the motivation can simply be found through knowledge generally available to a person having ordinary skill in the art.

> The rationale to modify or combine the prior art does not have to be expressly stated in the prior art; the rationale may be expressly or impliedly contained in the prior art or it may be reasoned from knowledge generally available to one of ordinary skill in the art, established scientific principles, or legal precedent established by prior case law. In re Fine, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); In re Jones, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). See also In re Kotzab, 217 F.3d 1365, 1370, 55 USPQ2d 1313, 1317 (Fed. Cir. 2000) (setting forth test for implicit teachings); In re Eli Lilly & Co., 902 F.2d 943, 14 USPQ2d 1741 (Fed. Cir. 1990) (discussion of reliance on legal precedent); In re Nilssen, 851 F.2d 1401, 1403, 7 USPQ2d 1500, 1502 (Fed. Cir. 1988) (references do not have to explicitly suggest combining teachings); Ex parte Clapp, 227 USPQ 972 (Bd. Pat. App. & Inter. 1985) (examiner must present convincing line of reasoning supporting rejection); and Ex parte Levengood, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993) (reliance on logic and sound scientific reasoning).

Since a person skilled in the art could reasonably deduce that the scribing system of Hokozaki is advantageous in providing increased flexibility by being able to place scribing lines in any location on the die carrier, and since a person skilled in the art could further deduce that a system using a database storing die sizes in communication with the scribing apparatus requires fewer additional cameras or measuring device than a system using active monitoring for scribing, the Examiner maintains that a combination of Takahashi and Hokozaki for the advantages supra would be apparent to a person skilled in the art based on scientific reasoning and generally available knowledge.

Regarding the rejection using Owens in view of Hokozaki and Watanabe, the Applicant argues that Watanabe merely teaches a size-insensitive bonding apparatus, and hence, none of the applied references appropriately suggest end-of-line processes that are size insensitive.

This is not persuasive, because Watanabe explicitly teaches the usage of a size insensitive conveyance means and that size insensitive, automated processing can be achieved through image processing, as explained in the rejection supra. Although Watanabe is primarily drawn to a die bonder and a wire-bonder, a person skilled in the art can reasonably deduce that a camera-based automated system would be usable with any apparatus to allow for diversified production. Furthermore, since the specification of the present application merely suggests that a system functions independently of die size by using conveyor belts (see page 29, lines 5-9) and camera recognition (see page 38) without providing any specifics of how the systems would be differently applied to different bonding station apparatuses, it is unclear how the system disclosed by the Applicant has in any way provided teachings beyond the purview of a person having ordinary skill in the art.

Insofar as such might be germane to future patentability issues, the Examiner also provides the following remarks:

The claims are only drawn to independent functioning of the system with respect to the size of the die, and not specifically to the size of the die strip. Since a variety of different sized dice may be bonded to die strips having the same size, it appears to the Examiner that the invention as claimed only would require die size independence for conveyance prior to bonding the die to the die strip, die-size independence for the die bonding apparatus, and die size

independence for the wirebonding apparatus. Conveyance after bonding the die, molding, scribing, testing, solder ball attachment, and sorting all appear to depend on the size of the die strip or the individual lead frame, and not on the size of the die that is bonded to the die strip or lead frame. The Examiner further notes that curing and plasma processes appear to have no correlation whatsoever with die size, and hence, automatically function independently of the die size.

Conclusion

10. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer M. Dolan whose telephone number is (571) 272-1690. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer M. Dolan
Examiner
Art Unit 2813

jmd

LAURA M. SCHILLINGER
PRIMARY EXAMINER